TOPIC 6

DISK STORAGE FUNDAMENTALS

- Disk storage is a non-volatile Storage System, Meaning it keeps data even when the power is off.

Types of Disk Storage

A) Hard Disk Drive (HDD)

- uses Spinning Magnetic dicks (platters).
- Data is read/write using a read/write head.
- Cheaper, Large Capacity.

B) Solid State Drive (SSD)

- NO Moving parts - uses flash memory.
- faster than HDDS.
- More expensive but reliable.

C) Optical Disks

- uses Laser to read/write.
- Examples: CD; DVD, Blu-ray.

D) Flash Storage

- USB flash drives, Memory Cards.
- Portable, uses NAND Flash Memory.

Def - Disk storage: refers to the Methods and Components used to store data permanently on computer storage devices such as hard disks, SSD, flash drives and optical disks.

Components of a Hard Disk (HDD).

1. Platters.
   - Circular disk surfaces coated with magnetic material.
2. Tracks.
   - Concentric circles on the disk surface where data is stored.
3. Sectors.
   - Small segments within each track.
   - The smallest physical storage unit on a disk.
4. Clusters (Allocation units).
   - Group of sectors used by the operating system as one unit.
5. Cylinders.
   - Set of tracks located at the same position on all platters.
6. Read/write Heads.
   - Device that reads or writes data on the platters.
7. Spindle.
   - Rotates the platters at high speeds (e.g 5400 or 7200 RPM).
8. Controller.
   Manages communication between the disk and the computer.

How Disk Storage Works.

Hard Disk (HDD)

✓ Platters spin continously.
✓ The read/write head moves to the correct track.
✓ Data is read or written in sectors.

v. OS groups several sectors into clusters.

SSD

Data is stored in memory cells.
No Mechanical Movement → very fast access.

Disk Access Methods

Sequential Access

✓ Data is accessed in order (one after another)
✓ Slower for searching Large files.

Random (Direct) Access

✓ Access any location directly using an address
✓ very fast and Most used in Modern systems.

Disk performance Terms

1. Seek Time.
2. Latency (Rotational Delay)
3. Data Transfer Rate.
4. Access Time.

Importance of Disk storage in Statistics

✓ Stores Large datasets (Excel, csv, SPSS, R data files).
✓ Keeps backups of research data.
✓ Enables fast retrieval and analysis.
✓ Supports data Seq security and long-term storage.